



# Ham News

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## POWER IN . . . and POWER OUT

Mobile/Portable Power Supply



Antenna Loading Coil

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# MOBILE/PORTABLE POWER SUPPLY

Here's a handy mobile/portable power supply designed for use with any one of a number of pieces of gear described in G-E HAM NEWS during the past few years—the Emergency-Portable Rig, the Mobile Modulator, the 6-Meter Receiver, the 6-Meter Transmitter, the 6-Meter CD Receiver, and the Mobile Marine Receiver.

This new power supply provides exceptional voltage regulation and incorporates some advanced thoughts in design. It's worth looking over—especially by fellows inclined to frown on vibrator and selenium rectifier circuits.

*Lighthouse Larry*

The Emergency/Portable Power Supply puts out 300 volts at 100 milliamperes and -40 volts bias—all from a 4 x 5 x 6-inch utility box. Input at full load is 6 volts d-c at 7.65 amperes. Efficiency is 67%. The supply is light weight, and voltage regulation is exceptional.

Ccompromising on the 300-volt, 100-milliampere size gives an adequate design which will not overburden the average battery. The supply to be described evolved after serious consideration of the most frequently observed faults of the customary vibrator type supply: Voltage regulation usually poor—with tremendous jumps even between half-load and full-load conditions; vibrator life short due to contact failure when self-rectifying type circuits are used; and conversion efficiency surprisingly low—often less than 50%.

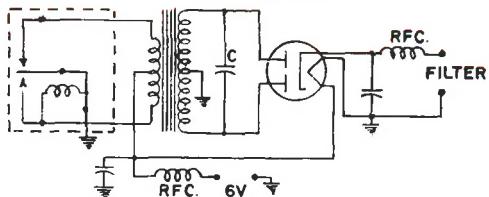


Figure 1

A typical nonsynchronous vibrator supply is shown in Figure 1. The vibrator is a reed with heavy contacts that switches the current from one side of the primary of the power transformer to the other. The reed is driven by a small magnet coil in one direction, and then springs back by itself to make the other contact—in a manner similar to the common door bell.

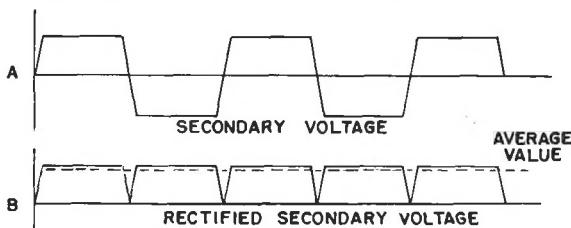


Figure 2

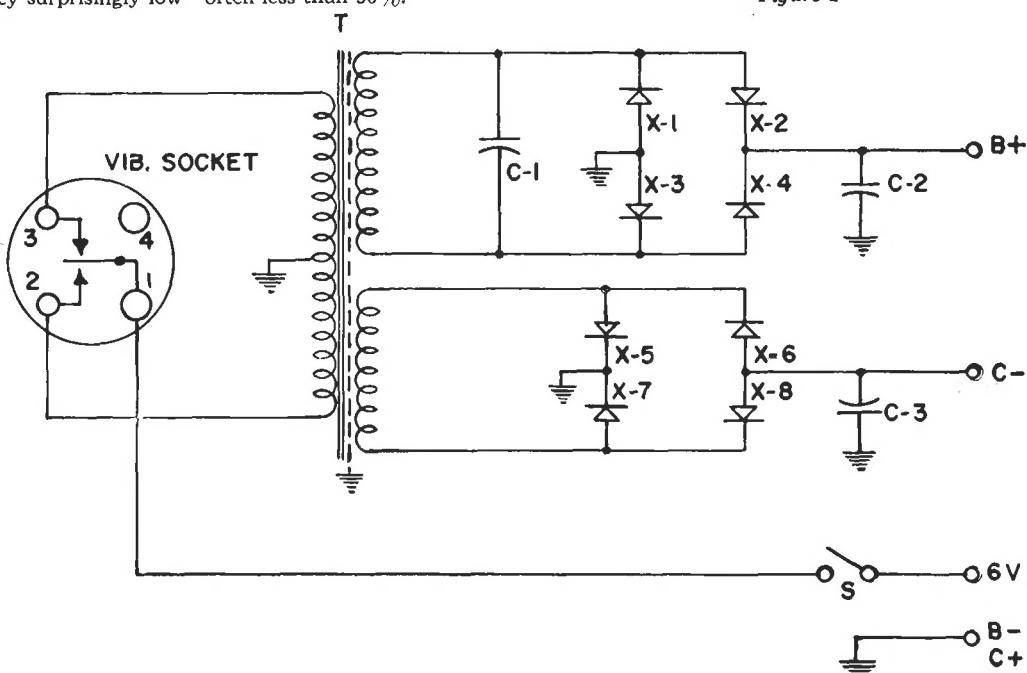


Fig. 3—Circuit diagram of the Mobile/Portable Power supply.

- C<sub>1</sub>—.01 mf 400-volt plastic buffer
- C<sub>2</sub>—20 mf 450-volt (Sprague EL-2)
- C<sub>3</sub>—50 mf 50-volt dry electrolytic
- Vib.—Vibrator unit (Cornell-Dubilier 5314)
- S—SPST toggle switch

- T—Vibrator transformer. Pri.: 6 v. DC, 7.5 A; sec.: 300 v., 100 ma.; 40 v. bias winding. (Ballastran BC-385—see text)
- X<sub>1</sub>-X<sub>4</sub>—100 ma 380-volt selenium rectifier (GE-6RS5GH1)
- X<sub>5</sub>-X<sub>8</sub>—selenium rectifier modified to one plate (see text)

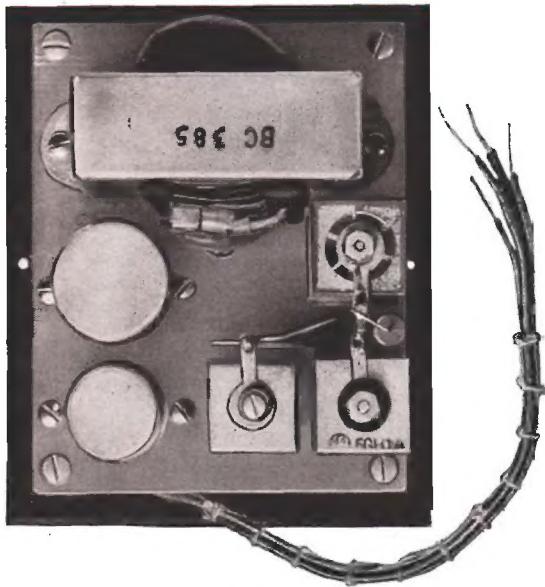


Figure 4

This action produces the effect of square-wave a-c excitation of the primary circuit—which of course is carried over to the secondary. See Figure 2 (A). Capacitor C in Figure 1 absorbs the inductive kick which occurs when the current flow is reversed. (If not suppressed, this kick would put "spikes" on the edges of the square wave, produce high surge currents through the rectifiers and cause sparking at the vibrator contacts.)

When the secondary voltage is rectified by a full-wave system, the output appears as in Figure 2 (B). Obviously, filtering this output is a relatively easy task. In addition, this wave form is extremely easy on rectifiers since the peak voltage is just slightly higher than the output voltage—resulting in relatively low peak currents through the rectifiers as compared with the usual power supply.

In a typical circuit, only half the transformer is in use at any one time—thus making the transformer rather inefficient for its size. While nothing can be done about the primary without going into a complicated vibrator structure, it is possible to make full use of the secondary with a bridge rectifier circuit as shown in Figure 3. Just by employing the bridge circuit, the secondary can handle 140% of the volt-amperes of the center-tapped circuit occupying the same space. Or, conversely, the secondary of a bridge rectifier transformer need occupy only 70% of the space required for a center-tapped full-wave secondary of the same rating.

As noted above, square-wave pulses make relatively low peaks—thus permitting use of replacement-type

\* Made by Ballastran Corporation, 1701 N. Calhoun Street, Fort Wayne 7, Ind. This company now also has designed for G-E HAM NEWS readers a special modulation transformer (BC-384) for use in the Mobile Modulator of the July-August, 1950 issue of G-E HAM NEWS. This modulator has made a hit with many hams. Transformers tested show high efficiency and low distortion. Ratings are: Pri. 10,000 ohms, plate-to-plate; Sec. 10,000/7,000/5,000 ohms at 60 ma. DC unbalanced load. Power output, 10 watts.

selenium rectifiers rated at 380 volts peak inverse voltage.

The selenium rectifier bridge offers further advantages: Improved voltage regulation due to low forward resistance as compared with vacuum rectifiers; and the fact no warm-up time is required—which may be important in some applications.

The transformer used in the supply illustrated has a high voltage winding rated at 300 volts and 100 milliamperes and a bias winding for supplying minus 40 volts.\*

The bias winding on the transformer is also equipped with a full-wave selenium bridge to provide a convenient bias supply for Class B audio systems and/or r.f. final circuits. This eliminates the C battery normally used in mobile or portable work.

Buffer condensers (C1 in Figure 3) usually are rated at 1500 volts. However, if they buff properly, as this one does, the high voltage rating is not necessary. Still, cautious constructors may wish to use a 1500-volt capacitor. We might note, also, that handbook vibrator circuits often call for a resistor of, say, 5000 ohms in series with the buffer condenser to limit the secondary current to a safe value should the buffer break down. Although this was not deemed necessary in the power supply herein described, it is another safety factor that may be employed if the builder wishes.

#### CONSTRUCTION DETAILS

The power supply illustrated fits into a 4 x 5 x 6-inch utility box with an on-off toggle switch on the front and a 4-terminal barrier-type strip on the back as shown on the front cover of this issue of G-E HAM NEWS. All other components are mounted on a plate of  $\frac{1}{8}$ -inch aluminum which just clears the lips of the utility box and stands off 1 inch behind the front cover as shown. Figures 4 and 5 show the layout. The 50-microfarad bias filter condenser is mounted under the plate between a terminal lug and one of the ground lugs at the base of the high voltage filter condenser.

Aside from careful placement of the components to get them all in the box, the only critical construction

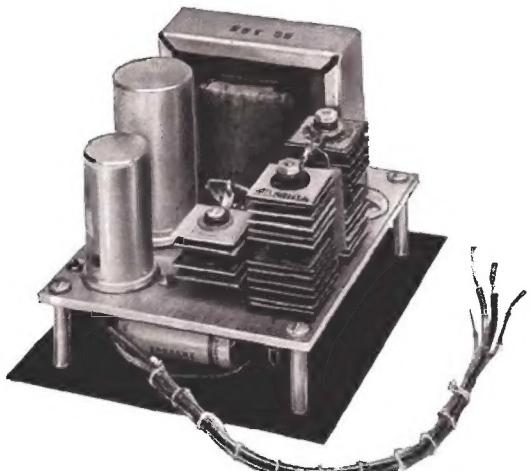


Fig. 5—Four-plate rectifier stack is the bias bridge.

# ANTENNA LO

problem is the modification of a fifth selenium rectifier to provide the bridge circuit for the bias voltage.

This small bridge is the four-plate stack seen at the left in Figure 5. The first step in taking apart a Model GE-6RS5GH1 rectifier is to pry up the washer clamp at the top. The plates may then be separated with a knife blade, but care must be taken not to disturb the "spider" sealed to each plate. Insert the knife between spider and adjoining washer—not between spider and plate.

The GE-6RS5GH1 rectifiers are marked with a splash of red on the cathode terminal—to which, of course, associated B plus leads are attached. In making up the small bias bridge, it is important to note which sides of the plates are cathode. In the GE-6RS5GH1, the "spider" is sealed to the cathode side. Thus to make a full-wave bridge with one plate in each leg, four of the plates are restacked with washers and suitable lugs. Note the cathodes are joined in the center as indicated in Figure 6.

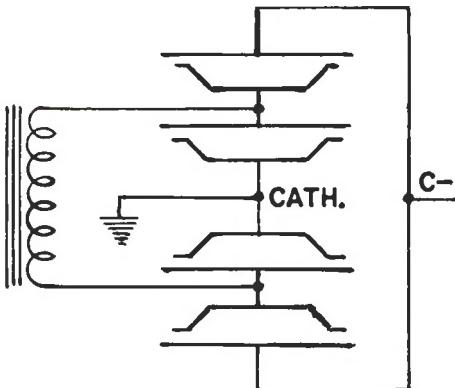


Figure 6

In wiring the power supply note that in the high voltage bridge the ground connection goes to rectifier anodes—whereas in the bias supply the ground goes to rectifier cathodes.

## PERFORMANCE

Figure 7 illustrates voltage regulation of this supply under actual test loads. A check for ripple showed .25 volt at no load and 4 volts at full load, peak-to-peak. A one-hour heat run left the supply cool to the touch. Efficiency checked out at 67%.

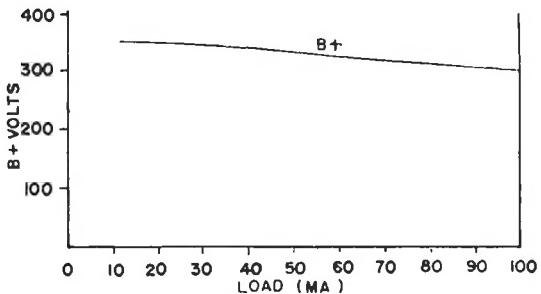


Fig. 7—Voltage regulation under test loads from 12 to 100 ma.

The construction of mobile radio equipment requires, in general, a long series of compromises between efficiency and practicality—compromises which start with the power supply and carry right on through to the antenna system.

The wonder of it is that we can construct any kind of equipment at all rugged enough to withstand vehicle vibration and bounce and yet capable of converting the prosaic 6-volt d-c intended for lights and ignition to r-f waves which travel hundreds and even thousands of miles.

On the higher ham frequencies, where antennas are smaller, problems involving stability become of first order importance. But on the bands below 10 meters, where stability is easier to lick, the most plaguing problem is perhaps the radiator itself.

## 60-FOOT WHIP?

On 75 meters—the most popular low-frequency mobile band—a 60-odd-foot quarter-wave antenna somehow just doesn't fit into the design of an automobile! So we compromise again and use a loading coil to keep the quarter-wave electrical length and at the same time reduce the physical length.

The compromise, however, is a compromise—in the finest sense of the word. It solves the physical problem but hinders us radiowise, because it cuts down the radiation efficiency of the antenna. And after all, what we are primarily interested in getting is the "soup" out into the air.

But as long as we must keep the antenna height down to 8 or 10 feet, we want to get the best deal we

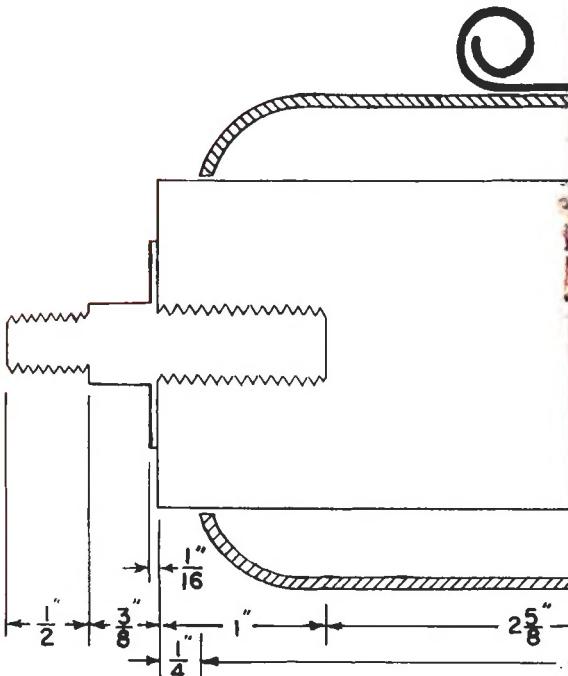


Fig. 1—How the plastic bottle and tun

# LOADING COIL

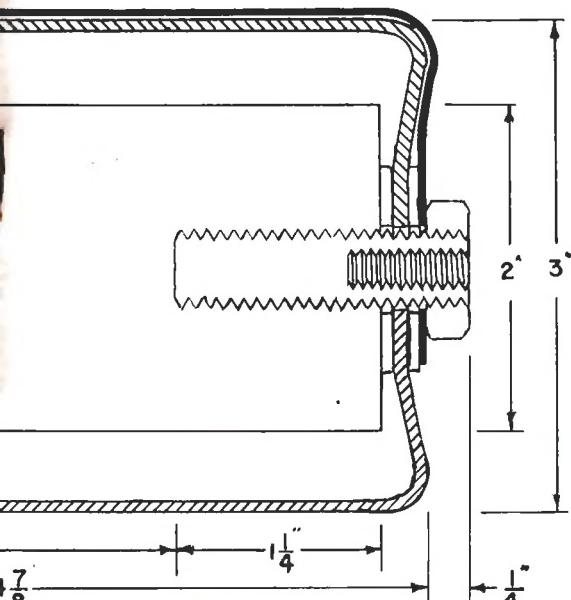
can. Thus the object to aim for is a coil with high Q and a means of critical tuning.

The coil illustrated is wound on 2-inch polystyrene rod, grooved on a lathe and drilled and tapped at both ends to receive special fittings fabricated to insert the coil in a standard  $\frac{3}{8}$ -inch, 8-foot antenna whip and spring mount. (The whip and mount illustrated are Ward products.) This particular coil has 53 turns and was originally designed for 3950 kcs work. Coil constants will vary from one installation to another, of course.

The good insulating quality of the poly rod—which contributes to high Q—is maintained in nasty weather by use of a 16-ounce round polyethylene bottle as a protective cover. The bottle used in this installation is a Plaxpac. Such bottles may be obtained at some drugstores, or from glass and plastic bottle distributors.

Modification of the bottle offers no problems. Simply drill a hole in the center of the bottom to pass the top fitting, and cut off the top so as to leave an opening which will fit snugly—but not airtight—over the bottom end of the coil form.

Tuning a loading coil usually is a nasty job. Some hams place the coil inside a car's rear trunk to protect it from weather—and then find they must shut themselves inside the trunk to tune properly because the position of the trunk door affects the loading. Taps are tricky to adjust and open the way to contact trouble. Tuning slugs or metal or wire rings work well but are either difficult to manufacture or hard to get at under a protective cover.



Tuning strap fit on the loading coil described.

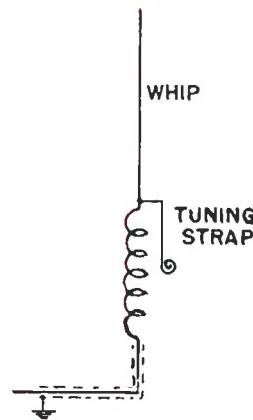


Fig. 2—Electrical connection of the tuning strap.

## SARDINE CAN KEY TUNER

The coil illustrated tunes with a sardine can key! A tuning strap of soft copper is simple to make and install as shown. Tuning is even simpler.

After preliminary checks are made to obtain the proper number of turns on the loading coil for the frequency and whip to be used, get the rig putting out the maximum signal with the strap straight down. Then with a field strength meter set up as far away as practical, start rolling up the end of the strap with a sardine can key. Although the sardine can key was left on the model shown at first, the designer soon discovered that it offered an irresistible temptation to children and to other hams. The solution was to break off the end of the key, leaving it fork-shaped for easy removal.

When checking for maximum signal on the field strength meter, you should, of course, remove the key and stand away from the antenna. Although the strap provides relatively fine tuning, care still must be taken not to pass by the resonant point.

In rolling the strap, make sure it actually curls and that you are not pulling the entire strap away from the loading coil. For you will want to secure it with tape once you have it set—and you will not want the strap bent out so that fastening it with tape will once again change the tuning.

Although the strap lowers the Q of the coil slightly, it has been found the advantages of this construction and the ease of tuning far outweigh the loss of Q.

Of course, those with infinite patience can go on from here with capacitive "hats," "wheels," "cans" or "baskets"—and more power to them!

## PARASITICS

In the schematic of the Mobile-Marine Receiver of the July-August, 1952, issue of G-E HAM NEWS two changes should be made: (1) The arm of SW-1A should be grounded; and (2) the connection between the cathode of the 6BE6 mixer and the junction point of R5 and C10 should be eliminated.

# Tricks & Topics

## TO TUNE A LOADING COIL

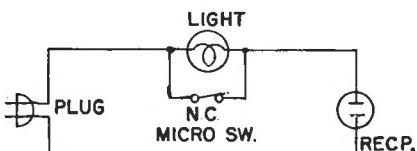
To vary a loading coil inductance over a range of approximately 75 kcs, use a single turn of heavy insulated wire twisted tightly around the coil. The writer used G-E Flamenol #14 with the ends bared and twisted together. Before final tightening, the shorted turn can be moved up and down the coil. The effect is minimum at the ends of the coil and maximum at the center. Wind your loading coil with several more turns than required to resonate the antenna at the lowest frequency—then move the shorted turn from one end toward the center until antenna resonance is obtained. On loading coils which are space wound or employ heavy wire, the shorted turn can be "screwed" up and down to find the resonant point.

MORLEY F. GOUGH, VE2GR



## A 'STAND-BY' SOLDERING IRON

To prevent a 100-watt soldering iron from overheating, I use a normally-closed micro-switch which cuts a 100-watt lamp into the circuit when the iron is placed on the stand. The stand, lamp socket and switch are all mounted on a small square of wood together with a female a-c receptacle for the iron cord. The stand is hinged with a strap of metal at one end, while the other end of the stand rests on the micro-switch. On "stand-by," the iron keeps fairly hot and is ready for use a few



seconds after being lifted off the switch. When the iron is in continuous use, a small block of wood is slipped under the free end of the stand next to the micro-switch to keep the switch from opening—thus maintaining full voltage on the iron.

CHARLES K. GABLER, W2CLU



## SCHEMATIC TRACING AID

Whenever it is necessary to copy a drawing or print, dampen the paper with a few drops of lighter fluid. This makes the paper sufficiently translucent so the drawing can be traced—yet leaves no ring or spot when the fluid evaporates.

HARVEY MULLER

## HANDY SOLDERING IRON STANDS

Instead of throwing away empty solder or fuse wire spools, we bend the ears over to make soldering iron stands. They take up less space than the regular stands, and there is always a backlog of extras.

HARRY J. MILLER



## SOLDERING IRON SLEEVE

When soldering in close places, wrap an asbestos sleeve around the iron to protect nearby parts. The sleeve can be wired in place just medium-snug so that it can be slipped back or off when not needed.

HENRY JOSEPHS



## SOLDERING TAPS ON COILS

The problem of soldering taps on coils where the turns are close together, without shorting to the adjacent turns, is a tough one. After several unsuccessful tries on an 80-meter 75-watt tank coil, I put strips of aluminum foil through the coil on each side of the place to be tapped. The type sold for food-wrapping is ideal, and enough thicknesses can be folded together to make a snug fit between turns. After soldering, the aluminum slips out without trouble, leaving a neat and solid joint. A big advantage of the foil is that it can be bent back easily to allow good contact between iron and joint.

CARL R. ZIMMER, W4WXP/2



## OILING MAST PULLEYS

Put about a foot of the antenna rope or cable in a pan of oil for a minute or so—then quickly pull the rope up through the pulley and see-saw the oiled section around the pulley until you see the oil splashing out.

MICHAEL ROGERS

**How did you solve that last problem that almost had you stumped? Be it about tubes, antennas, circuits, etc., Lighthouse Larry would like to tell the rest of the hams about it. Send it in! For each "trick" published you win \$10 worth of G-E Electronic Tubes. Mark your letter "Entry for Tricks and Topics" and send to Lighthouse Larry, Tube Department, Bldg. 267, General Electric Company, Schenectady, New York, or in Canada to Canadian General Electric Company, Ltd., Toronto, Ontario. The Companies shall have the right, without obligation beyond the above, to publish and use any material submitted to this column. No entries returned.**

# **SWEEEPING *the* SPECTRUM**



Ham radio is growing by leaps and bounds. Chairman Paul A. Walker of the Federal Communications Commission reports that licenses now number about 115,000.

This means an increase of more than 40% since the years immediately following World War II. Such swift growth is a sobering fact. Let's pull switches and think about this a few minutes.

It is a fact that participation in rule-making—making our wants and needs known to the FCC—is as important a part of ham radio as calling CQ or building a VFO.

We hear much talk these days that citizenship as a vital, living force has been on the downgrade—that citizenship too often is taken for granted. The percentage of qualified voters who actually cast ballots has in recent years, at least until the last election, been disgracefully low.

Let's not complacently take the existence of ham radio for granted. Our frequencies are valuable—and we have them because we are deemed important to civilization.

Chairman Walker put it this way in his remarks at the presentation of the 1952 Edison Radio Amateur Award in Washington recently:

"Almost every day amateurs are called upon to provide emergency communication . . . They are active in the military and civilian defense effort . . . They talk to one another around the world . . . Their techniques contribute to the advancement of the art and of the industry . . . They are an important factor in making for better international good will and understanding . . . They have the best wishes and the blessing of the Federal Communications Commission."

Sweet music, yes. But it is up to us to continue to justify such praise.



Some of the fellows complain that one must be a lawyer to keep up with proposed rule changes these days. The point is well taken. New rules have been coming fast and furious over the past few years. We'd wager a couple of kilowatts to a milliwatt that you could count on your fingers and toes the number of W's and K's who right now could rattle off correctly the precise frequencies on which they are allowed to operate.

But that is the price we pay for civilization. As society and science become ever more complicated, so must the average human brain speed up—lest the individual be left by the wayside. Crying for a return to the "good old days" is no solution; for history shows that "good old days" never return.

Ham organizations—from national associations to local clubs—have an increasingly important job these days. They can and must intensify their efforts to help members keep informed of rules and regulations—new and proposed. Of course, most clubs do this as a matter of course. But in many clubs a little revitalization of such activity would be a big help—perhaps by setting up special committees to analyze and report on new rules and regulations—instead of leaving the job to already-overburdened club secretaries.

What say, club officials? Got any good ideas on the subject? If so, we'll try to pass them along.



The individual ham has an even more important job. The FCC wants to hear from you—wants to hear what you think of proposed regulations, wants to get your suggestions on how to best use the ham bands. Don't think your voice is like a cry in the wilderness. For public officials pay considerable attention to individuals—especially when they hear from a lot of individuals.

And right now is a good time to speak your piece. For we are in a period of transition from the old Class A, B, and C system to a new order encompassing classifications for Novices and Technicians as well as General and Extra grade hams.

Just what the FCC is aiming for remains somewhat of a mystery at this writing. The present Amateur Extra Class license now carries no special privileges. And many hams say: "Why slave for a college degree if it won't get you above the ditch-digging level?"

The question is pertinent, but perhaps a little short-sighted. We think it is reasonable to assume that eventually Amateur Extra ticket holders *will* get some special privileges. Thus, working for that "college degree" now may pay dividends in the future.



The important point, however, is that every ham simply must put down his soldering iron and grid dip meter once in a while and write to the FCC—making known his thoughts on proposed regulations, preferably even before they are proposed.

Final rules never satisfy everyone. But the suggestions from all of us *must* get to the FCC members if rules and regulations are to represent majority interests. This democratic process takes time and effort by all of us. But it's our way of life.

Here's the address: Federal Communications Commission, Washington 25, D. C.

## 1952 Edison Award Winner



### DON MULLICAN, W5PHP

Operating almost continuously for five days, Don served as the sole link between rescue HQ in Searcy and devastated Judsonia in the Arkansas tornadoes of last March. Traffic to and from the nation was funneled through his ARC-5 on 75 meters.

At the left he shows how he used a haywire telephone nailed to the wall to link his station to rescue HQ. Don was nominated for the award by W5DVI who operated an emergency station at Judsonia with a crew that relied on the W5PHP link.

Don is 20, a bible student at Harding College—and you may hear him as a ZS or OQ in another year or so because he plans to become a missionary. He received a trophy, a wrist watch and a trip to Washington and New York City.

Special citations went to:

**W1DBM**—TVI research and development.

**W6JJU**—Outstanding traffic handling to servicemen overseas.

**W8FYW**—Developing radio course for the blind.

**W9NZZ**—Handling traffic to Arctic weathermen.

The 1952 Edison Radio Amateur Award was sponsored by the G.E. Tube Department. Judges were: G. L. Dosland, ARRL president; G.E. Sterling, FFC commissioner; and E. R. Harriman, Red Cross president.



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